REMARKS

Applicant respectfully requests reconsideration and allowance of subject application. Claims 1, 5, 7-9, 15, 19, 21-23, 31, 36, 41, 50, 55, 60 and 63 are amended in this Response. Claims 1, 7-9, 15, 21-23, 63 and 65 are independent claims. Claims 1-5, 7-10, 15-19, 21-24, 29-43 and 48-66 are pending in the present Application.

Claim Rejection Under 35 U.S.C. § 101

Claims 1-5, 7-19 and 21-66 stand rejected under 35 U.S.C. § 101. The Office asserts the claimed invention is directed to non-statutory subject matter. Applicant traverses this rejection.

The Office maintains that claims of the present Application recite only *abstract ideas* and therefore do not advance the "technological arts." Applicant respectfully submits, for the following reasons, that the Office has improperly rejected the claims under 35 U.S.C. § 101.

As is commonly understood, the utility of an invention must be within the technological arts. A computer-related invention is within the technological arts. A practical application of a computer-related invention is statutory subject matter. And, an invention that has a practical application in the technological arts satisfies the utility requirement.

Each of the rejected claims sets forth subject matter that relates to creating a binary tree data structure. Moreover, each of the claims includes subject matter teaching that the data structure is embodied in a computer-readable medium and/or the claimed methods are stored on computer-readable medium in the form of computer-executable instructions. Therefore the claims set forth one or more

computer-related inventions. This shows that the claims are indeed within the technological arts.

When determining if the claimed invention falls within the technological arts, the Office should also determine if the invention applies to "at least one practical application." Merely one example is necessary to show that the claimed invention has utility. Applicant respectfully submits that the creation of binary trees has long been held as being instrumental in optimizing database queries. But, the Office does not need to consider the Applicant's position as being dispositive. For example, one of the documents relied upon by the Office to reject the claims discloses that the use of binary trees can help solve the critical problem that applications have in locating a specific stored item quickly. The Office is directed to "Introduction to Algorithms" by Cormen, Leiserson and Rrivest, first page, Chapter 6. The foregoing discussion is further evidence that the claims are within the technological arts.

The Office further maintains that the claims must be rejected because they merely recite abstract ideas. According to the Office's own guidelines related to this topic, a claim can only be rejected using the abstract idea rationale if a claim "solely calculates a mathematical formula," or the claim is directed to "a computer disk that solely stores a mathematical formula." The quoted language is the Office's attempt to articulate when claim language does not produce a tangible result. Here tangible does not require that the claim language is tied to a machine or apparatus. Instead, tangible only requires that the claim language is tied to an application that produces real-world results. The creation of a binary tree data structure, which the claims of the present Application articulate, has real-world use and can provide for real-world results. Again, one example of this is the use

of binary trees in database applications. The discussion of this paragraph also shows that the claims of the present Application are within the technological arts.

In accordance with the above, reconsideration and withdraw of the under 35 U.S.C. § 101 rejection are requested.

Claim Rejection Under 35 U.S.C. § 112

Claims 1-5, 7-19 and 21-66 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. Applicant traverses this rejection.

The Office maintains that the subject matter a "parent node," found in the rejected claims, is indefinite. In the current Office Action, the Office states it is "not clear how a binary tree structure is created when the parent node is not linked to any of the left or right side descendent medians." To address the Office's concern, the Applicant has amended a number of the claims to clarify that a median from each of the first left and right groupings is linked to the parent node. The Office is directed, in particular, to amended claims 1, 7-9, 15, and 21-23.

To address the rejection of claim 63, Applicant has amended the claim to recite "a median of a first right side grouping is linked to the parent element." It was not necessary to amend the claim to include subject matter identifying that a median of a left side grouping is linked to a parent node, as step (e) of the claim recites that "a median element of a lift side grouping" is linked to an "element reached in step (d)." The Office is respectfully requested to review steps (d) and (e) of the claim for additional details. Such a review of the claim will show that

the subject matter thereof complies with at least 35 U.S.C. § 112, second paragraph.

Applicant respectfully submits that the subject matter of the claims, as amended, sets forth in a definite manner the method in which a binary tree is created.

The Applicant submits that the rejection of claim 65 under 35 U.S.C. § 112, second paragraph, is improper. In particular, step (b) recites that "a median element of the list" is designated as "the parent element." In step (f), a "median element of step (e)" is linked to "the parent element." This subject matter, coupled with other subject matter of the claim, shows that the rejection under 35 U.S.C. § 112, second paragraph, does not properly apply to claim 65.

Several dependent claims have been amended hereby in order to rectify a number of minor informalities.

In accordance with the above, reconsideration and withdraw of the 35 U.S.C. § 112 rejection are requested.

Claim Rejection Under 35 U.S.C. § 103

Claims 1-5, 7-19 and 21-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Introduction to Algorithms" by Cormen, Leiserson and Rrivest (hereinafter "CLR") in view of "Indexing Large Metric Spaces for Similarity Search Queries" by Bozkaya and Tolga (hereinafter "BT"). The rejection is respectfully traversed.

Each of the independent claims of the present Application recite "creating a binary tree data structure…from an ordered list of at least four elements," where the method includes "determining whether the list has an even or odd number of

elements," and separating or determining a "parent node" or "parent element" is determined "based on whether the list has an even or odd number of elements." The "parent node" or "parent element" separate left and right side "groupings." The claims further recite "creating" left and right "side descendent nodes" once the left and right side groups are found. In creating the left and right side nodes, medians of each of the left and right side groups are linked to previous medians. (*See claims 1, 7-9, 15, 21-23, 63 and 65 specifically*.)

Applicant respectfully submits, for the following reasons, that the combination of CLR and BT fails to each or suggest the limitations of the claims currently pending in the present Application.

I. Initial Comments

The Applicant hereby requests that the Office clarify several statements made in the most recent Office Action. The last paragraph of page 4 and the first paragraph of page 5, in the Office Action, articulate the Office's position for finding the claims of the present Application unpatentable. These two paragraphs never mention where the combination of CLR and BT teach or suggest the claimed subject matter: "determining whether the list has an even or odd number of elements," and separating or determining a "parent node" or "parent element" is determined "based on whether the list has an even or odd number of elements."

In the second paragraph of page 5, the Office states "selecting a side for processing, where left side groupings are in preference to right side groupings and determining if a list has an even or odd number of elements was a common programming technique[,] before the Applicant's claimed invention[,] used for selecting an appropriate element as the median." The office then proceeds to conclude that the instant claimed invention is obvious.

The foregoing demonstrates that the combination of CLR and BT fails to teach or suggest each and every limitation of the claims. Therefore, the Office has not presented a *prima-facie* case of obviousness.

Furthermore, the Office has admitted on the Record that the combination of CLR and BT do not teach each and every limitation of the claims. For example, the Office states on page 6, third full paragraph, "CLB/BT teach most of the elements in the claims as best as the Examiner is able to ascertain and any missing elements not directly disclosed by CLR/BT [the] Examiner ascertains are obvious; such as selecting a side for processing or determining if a list has an even or odd number of elements." (Emphasis added.) The Office is respectfully reminded that a combination does not render the claims obvious if most of the elements of the claims are taught by the combination – all of the elements must be taught the combination. Furthermore, the Applicant respectfully submits that the Examiner is not permitted to *ascertain* that limitations of a claim are obvious. Obviousness must be shown by presenting a *reference* or a combination of *references* that *teach* the claimed invention. The Examiner is not considered a reference that may be used to substantiate obviousness under 35 U.S.C. 103(a).

The Office is respectfully requested to remedy the above-discussed errors in a subsequent non-final Office Action on the merits. If the Office is unable to remedy the errors, the Applicant respectfully submits that the obviousness rejection must be withdrawn and the claims of the present Application should be allowed.

II. CLR and BT Combination

The CLR document teaches the broad ideas of searching and creating a binary search tree, which the CLR document often refers to as "B-trees." The Office recognizes the CLR document does not teach the specifics of the binary tree data structure method of the present claims. The Office alleges BT remedies the deficiencies of the CLR document. Applicant disagrees with this assertion.

BT teaches the concept of creating a binary vantage-point (vp) tree. According to the BT document, the binary vp-tree is created using a distance metric that chooses an arbitrary vantage point from a group of objects as a parent node.

The *arbitrary* choice of a parent node according to BT is fundamentally different than the methods set forth in the claims of the present Application. Because the parent node of BT is chosen *arbitrarily*, it is clear BT does not/would not teach or suggest separating the list of elements "based on whether the list has an even or odd number of element." Here, the separated list is defined by "a median of the list, wherein the median is a left element of two middle values of the list when the list has an even number of elements, or the median is a middle value element of the list when the list has an odd number of elements." (*See claims 1, 7-9, 15, 21-23, 63 and 65 specifically.*)

In addition to the above, the combination of CLR and BT fails to teach or suggest the limitations of the claims currently pending in the present Application for the following reasons. Each of the rejected independent claims recites that "a binary tree data structure" is created "from an ordered list of at least four elements." Assuming CLR and BT would arbitrarily pick the same parent node as the methods set forth in the claims of the present Application, the resulting tree

would nevertheless be structured differently than a binary tree structure created by an implementation of the present Application.

For example, let an ordered set equal S = (1,2,3,4). Using the CLR and BT technique, assume an *arbitrary* vantage point is selected as S_v=2. This *arbitrary* vantage point happens to correspond to the parent node an implementation of the present Application would select. According to CLR and BT, M is now calculated as the median distances of all set members from S_v. In particular, for the set S, the set of distances D = d(S_v, S_i). In this case, D = (1,1,2), where d(2,1) = 1, d(2,3) = 1, and d(2,4) = 2. Deferring to the left, 1 is the median (M) of those distances.

Now, the remainder of the set is divided into a left set S_l and a right set S_r based on a distance from the *arbitrary* vantage point S_v. If a set member is less than or equal to M, it is placed in S_l, and if a set member is greater than or equal M, it is placed in S_r. The resulting sets would be S_l = (1,3) and S_r = (4). The number 4 must be placed in S_r to avoid an unbalanced tree. The alternative would be to place 4 in group S_l, which would be contrary to the purpose of creating a binary vp-tree that is balanced.

The groups S_l = (1,3) and S_r = (4) will not result using an implementation of the present invention. Assume again that the set is S = (1,2,3,4). According to an implementation of the present Application, 2 is the parent node. Based on the claims of the present Application, a left side grouping for set S is (1) and a right side grouping for set S is (3,4). These are not groupings that CLR and BT would find.

For the reasons presented above, Applicant respectfully submits claims 1, 7-9, 15, 21-23, 63 and 65 are at least allowable over CLR in view of BT. The

remaining dependent claims are allowable by virtue of their dependency on one of the discussed independent claims.

Conclusion

Claims 1-5, 7-10, 15-19, 21-24, 29-43 and 48-66 are in condition for allowance. Applicant respectfully requests reconsideration and prompt allowance of the subject application. If any issue remains unresolved that would prevent allowance of this case, **the Examiner is requested to urgently contact the undersigned attorney to resolve the issue**.

Respectfully Submitted,

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